

# Small, Capable, Readily-Replicable Payloads for Remote Sensing of Volatiles

Completed Technology Project (2016 - 2018)



## Project Introduction

Development of a small, scientifically capable, readily-replicable IR point spectrometer, miniaturizing by several factors a crucial (and proven) technique to enable to assay of volatiles from small satellites.

Develop an IR point spectrometer able to measure 2.0-4.0  $\mu\text{m}$  (SWIR) and 5.5-12  $\mu\text{m}$  (MIR) reflectance and emission from a 0.05 albedo asteroid with an IFOV of  $\leq 5\text{mrad}$  and with SNR sufficient to detect 1% MIR band depths due to OH/H<sub>2</sub>O at 10 nm spectral resolution and distinguish absorptions related to Si-O vibrations that distinguish key classes of asteroids and the extent of aqueous alteration. The volume is not to exceed 2U and the target rebuild cost of the payload element (for a cubesat-class implementation; scalable to higher class if desired) is not to exceed \$200k.

## Anticipated Benefits

Enables scientifically useful detection of volatile and silicate species on dark objects like asteroids and terrestrial planets using a 2U instrument that can be carried on small spacecraft (Cubesat/Smallsat class).

Enables detection of volatile and other species on small dark objects using small spacecraft (Cubesat/Smallsat class) that could be useful for commercial activities, including assessment of water-content and extractability for fuel production.

Enables scientifically useful detection of volatile and other species on dark objects using small spacecraft (Cubesat/Smallsat class).

## Primary U.S. Work Locations and Key Partners

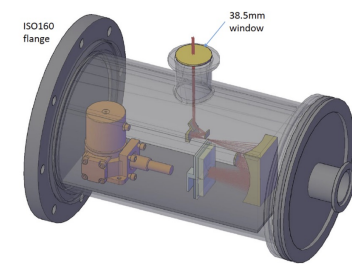
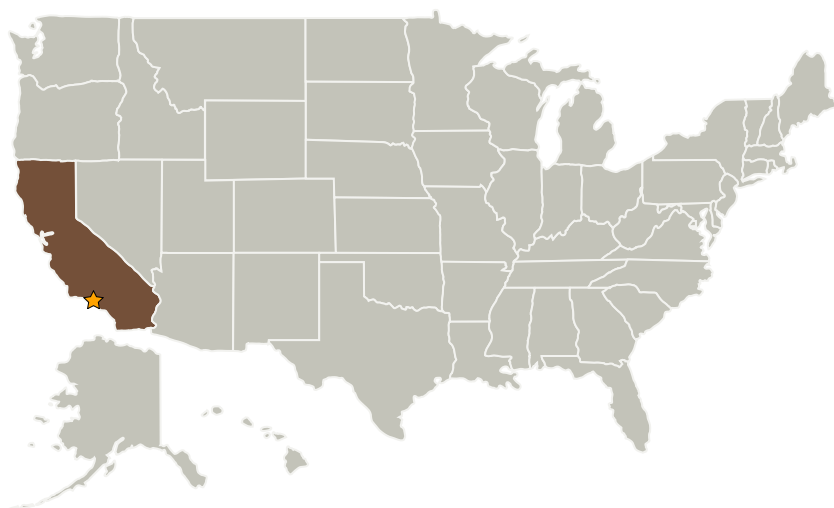


Image of development unit configured in the testbed.

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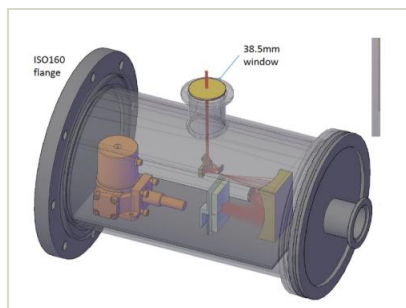


Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California

## Primary U.S. Work Locations

California

## Images



### JPL\_IRAD\_Activities Project Image

Image of development unit configured in the testbed.  
(<https://techport.nasa.gov/image/28086>)

## Organizational Responsibility

### Responsible Mission Directorate:

Mission Support Directorate (MSD)

### Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

### Responsible Program:

Center Independent Research & Development: JPL IRAD

## Project Management

### Program Manager:

Fred Y Hadaegh

### Project Manager:

Fred Y Hadaegh

### Principal Investigator:

Carol A Raymond

### Co-Investigators:

Jordana Blacksberg  
Bethany Ehlmann  
William R Johnson  
Matthew E Kenyon

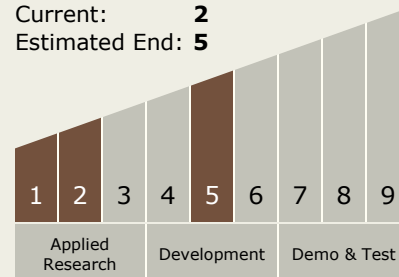
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## Technology Maturity (TRL)

Start: **1**  
Current: **2**  
Estimated End: **5**



## Technology Areas

### Primary:

- TX07 Exploration Destination Systems
  - └ TX07.1 In-Situ Resource Utilization
    - └ TX07.1.1 Destination Reconnaissance and Resource Assessment

## Target Destinations

Others Inside the Solar System, Foundational Knowledge

## Supported Mission

### Type

Push